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ABSTRACT

The value of children's drawing and writing in science lies in its potential to assist children in making observations, remembering events, and communicating understandings. However, a neglected aspect of children's representations is that they can serve the teacher as guide to children's understandings and as a diagnostic tool. By creating their own journal pages, children are able to depict their ways of seeing and understanding the science phenomenon, constructing or reconstructing the phenomena through their own lens of experience. The objective of this study was to investigate how children represent science phenomena and activities on the journal page. The sample size consisted of 16 first and second grade students participating in a one-week intercession class on earth materials. Data sources included the children's self-produced science journals and field notes based on children's talk and activity. This qualitative and naturalistic research showed that the majority of the students used their science journal pages to represent either the science materials or the physical activity itself. Their understanding was characterized by a simple recording of what happened in the activity. Only a few children represented an understanding of the science processes of mixing and separating as dependent on the size differences between the earth materials. (Contains 5 data tables and 3 figures.) (CCM)

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Young Children's Representations Of Earth Materials on the Science Journal Page

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Running Head: Young Children's Representations

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Young Children's Representations Of Earth Materials on the Science Journal Page

Objectives of the Study

The value of children's drawing and writing in science lies in its potential to assist children in making observations, remembering events, and communicating understandings; however, a neglected aspect of children's representations is that they can serve the teacher as a guide to children's understandings and as a diagnostic tool (Elstgeest, Harlen, & Symington, 1985). By creating their own journal pages children are able to depict their ways of seeing and understanding the science phenomena, constructing or reconstructing the phenomena through their own lens of experience (Shepardson, 1997). The objective of this study was to investigate how children represent science phenomena and activities on the journal page. The research questions were:

- How do children represent the science activity itself on the journal page?
- How do children represent their understandings of the science phenomena on the journal page?

Significance of the Study

Typically, the use of children's self-produced journals in elementary classrooms is confined to language arts activities (Tompkins & Hoskisson, 1991). Further, children's self-produced journals are often neglected or underestimated in the science teaching-learning-assessing process (Elstgeest, Harlen, & Symington, 1985). Yet, the products children create with their writing and drawing represent their science understandings so that their self-produced journals provide a window for viewing their understandings (Doris, 1991). Although children's self-produced science journals provide an opportunity to access and assess children's understandings in science (Dana, Lorsbach, Hook, & Briscoe, 1991), the existing research has not sufficiently explored the variety of way in which children graphically represent their understandings of science phenomena or the activities in which they engage.

Theoretical Underpinnings

The theoretical basis for this study is provided by the work of both Piaget and Vygotsky. According to Piaget, young children's drawings are realistic in intent, that is children draw what they think rather than what they see. Around the ages of 7 or 8 children's drawings begin to represent movement and transformations while younger children's drawings tend to be static in nature (Piaget and Inhelder, 1969). Similarly, Vygotsky (1978) noted that young children's representations often reflect what they know about the object more than what is actually perceived, young children name and designate more than represent. Young children's representations are symbolic in nature and are not exact copies of the objective phenomena. Children take the meaning of their drawings to be an object that is similar to the observed, not as a representation or symbol of the object (Vygotsky, 1978). The observed phenomena become symbolic of all similar phenomena of that type (Elstgeest, Harlen, & Symington, 1985).

Design and Procedures

This study was qualitative and naturalistic in design (Patton, 1990); the researchers did not manipulate the manner in which the children used their science journals to represent their understandings of the phenomena or activities.

Instructional Context of Study. On Day 1, the children explored the physical attributes and properties of five earth materials: clay, silt, sand, pebbles, and gravel. Next, on Day 2, the children investigated mixture of pebbles and sand. Each child first placed pebbles in a vial, added sand, and shook the vial to mix the substances. In the next activity on Day 3, the children used a sieve to separate the sand and pebbles. In all three activities the children were encouraged to draw and/or write in their science journals, but were not given specific instructions about how, when, or what to draw or write in their journals.

Sample size. The sample consisted of 16 first and second grade students participating in a one-week intersession class on earth materials. The elementary school is situated in a low socio-economic area in a medium sized Midwestern city.

Data Collection. The data sources for this study included the children's self-produced science journals and field notes based on children's talk and activity. These data sources allowed the children's journal writing and drawing to be analyzed for patterns in their understandings of the phenomena and approaches to representing both the phenomena and activities.

Data Analysis. Methods of inductive analysis (Patton, 1990) were used to identify patterns in children's understandings and representations of the phenomena and activities. Each journal was initially reviewed independently by the three researchers and then discussed, negotiating coding categories that emerged from the data. The researchers then independently coded the journals based on the coding categories. After the researchers resolved discrepancies in coding they reached consensus, thereby establishing reliability in coding. Triangulation was achieved by comparing children's self-produced journals and field notes.

Findings

Although all of the children used drawings to represent the earth materials on Day 1, they used print primarily to either label or to describe the substances in the exploring earth materials activity. During this activity, children used single nouns or single adjectives to represent the five earth materials. For example, the adjectives "little" and "hard" predominated; "little" was used in seven instances and "hard" was used nine times. To identifying the earth materials the children overwhelmingly used the generic term "rock(s)" to label both pebbles (60% of the time) and gravel (80% of the time). Of the remaining earth materials, the noun "sand" was used in 10 of 11 instances to represent sand. Seven children used the word "clay" to represent the clay, while four used "playdo." None of the children used the term "silt" to describe any of the substances although three used "dust," five used "dirt," one used "chalk," one used "baking

soda," and one used "sand" to identify the silt. In order to identify an apparently unfamiliar earth material, these children used the names of more familiar ones.

The instructional sequence or the order children received the earth materials influenced how the children represented the earth materials on the journal page. Children who received the pebbles first used the word "rocks" or "gravel" to identify the substance (six of eight children). When these eight children then received the gravel, they labeled it as "rocks." In contrast, when the remaining eight children received the gravel first, only one labeled the material as "gravel;" five other children labeled it "rock(s)," and two children had no print. When these children next received the pebbles, three used no print at all, four labeled it "little rocks," one changed "little rocks" to "pevrles," and one labeled it "pebose" from the start. Only two children used the word "pebbles" to label this substance. Thus, when children received the smaller pieces of rock (i.e., pebbles) second, they saw a contrast with the larger pieces of gravel; this was reflected in more refined labels for the pebbles. On the other hand, when children received the pebbles first, no contrast was noted in their labels; everything became simply "rock."

Next, we found that the children shifted from primarily labeling and describing on Day 1 to a combination of representing the immediately observed and labeling in the mixing activity on Day 2, and then to predominantly depicting the immediately observed context (50%) in the separation activity on Day 3. In other words the graphic contexts of the children's journal pages neither chronicled nor explained the mixing process. Labeling was the second most prevalent graphic context for the mixing activity, accounting for 29% of the journal page entries. Describing accounted for 43% of the journal entries for Day 1's exploring earth materials activity; compared to 13% in both the mixing and the separating activities. In representing the separation activity, 10 children (67%) used no print at all while only 4 children (26%) omitted any use of print in the mixing activity. Children overwhelmingly relied on drawing alone to represent the process of separation. Therefore, children's representation of the separation activity was not fully developed as their representation of the mixing activity.

The increasing complexity of the mixing and separating activities did result in a more elaborated use of print by some children. Children used more elaborated print (i.e., beyond single words) to represent the mixing (20%) and separating (33%) activities compared to the exploring activity (0%). For example, in the mixing activity, one second-grader elaborated his labeling with an analogy to characterize the sand-pebble mixture. At the bottom of his page he used a metaphor that placed the final state of the substances in an imaginary context: "pebbles and sand the rockes grave." Only one child used multiple sentences in combination with her drawings to characterize the separation activity. Her drawings depicted the pebbles trapped on the sieve and the sand on the plate. "They were separate," she wrote. "Some Gravels and Sand but the sand was on the plate. The peebles were on the sieve." In this way she indicated the final separated state of the earth materials. Although the use of print was at its lowest on the day of the separation activity, it was on this day that we saw the highest use of descriptive phrases to characterize the separation process. Four children used descriptive phrases as a posed to only one child on the day of the mixing activity.

In summary, the majority of children in this study used their science journal pages to represent either the science materials or the physical activity itself. Their understanding was characterized by a simple recording of what happened in the activity. Only a few children represented an understanding of the science processes of mixing and separating as dependent on the size differences between the earth materials. This point is, in fact, more salient from the point of view of the science investigator and provides the basis for explaining the linked processes of mixing and separating. Because these were unfamiliar types of science experiences for these children, they need new ways of identifying what is important in a given science situation, in other words, new ways to decide what is salient from the scientist's point of view. This brings us back to representation on the page; children can now represent experience, understandings, and language on the page in new ways.

References

Dana, T.M., Lorsbach, A.W., Hook, K., & Briscoe, C. (1991). Students showing what they know: A look at alternative assessments. In G. Kulm & S.M. Malcom (Eds.), *Science assessment in the service of reform*. Washington, DC: Association for the Advancement of Science.

Doris, E. (1991). *Doing what scientists do: Children learn to investigate their world*. Portsmouth, NH: Heinemann.

Elstgeest, J., Harlen, W., & Symington, D. (1985). Children communicate. In W. Harlen (ed.), *Primary science: Taking the plunge*. Portsmouth, NH: Heinemann.

Patton, M.Q. (1990). *Qualitative evaluation and research methods*. Newbury Park, CA: Sage Publications, Inc.

Piaget, J. & Inhelder, B. (1969). *The psychology of the child*. New York: Basic Books, Inc.

Shepardson, D.P. (1997). Of butterflies and beetles: First graders' ways of seeing and talking about insect life cycles. *Journal of Research in Science Teaching*, 34(9), 873-889.

Tompkins, G.E. & Hoskisson, K. (1991). *Language arts: Content and teaching strategies*. New York: Macmillan.

Vygotsky, (1978). *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.

Table 1. Graphic Contexts

Category	Description
Place-holding	The drawing or writing has value as a page-filler as in books, where each page contains a marking. No concrete or imaginary referent or quality can be associated with the markings on the page.
Gestural Activity	The graphic product has value as a motoric or physical activity that represents the quality of an object, event, or phenomenon. The context lies in the movement of the marker or pencil on that page.
Identifying or labeling	The child only labels or names the earth material or indicates what it is, implicitly distinguishing it from other substances by designating it as a separate referent.
Describing	The child elaborates one or more physical detail(s) about the earth material.
Characterizing use or manipulability	The child indicates a way(s) in which a human can use or handle the material; for example a child may draw a person squeezing a ball of clay or building a castle of sand.
Indicating the immediately observed	The child uses drawing or writing to contextualize the earth material by surrounding it with people, materials, or processes drawn from the immediately observed classroom or from the science activity in which the child has engaged.
Specifying a natural environment	The child uses drawing or writing to contextualize the natural location of an earth substance; for example, the child may draw a field or show a layer of clay.
Creating an imaginary context	The child uses writing or drawing to contextualize the earth material by including it in an environment or scene not immediately observed by the child (e.g., the child has experimented with clay but draws cookies or a pizza).

Table 2. Elaborated Print Categories

Category	Description
Descriptive Phrase	A phrase that tells what something is like, usually containing one or more adjectives followed by a noun.
Analogy	A simile or metaphor likening one thing to another.
Noun Chaining	A series of nouns usually linked by a connective such as "and."
Sentence Chaining	A series of independent clauses linked by connectives such as "and" or "but."

Table 3. The Graphic Context of Children's Journal Pages by Activity

Graphic Context	Exploring Earth Materials					Mixing Earth Materials	Separating Earth Materials
	Pb	Cl	Sa	Gr	Si		
Immediately Observed	0	0	0	0	0	13	13
Label/Identify	10	11	12	12	11	10	5
Characterizing Use/ manipulation	3	1	2	0	1	0	1
Describes	9	14	4	10	12	4	3
Natural Environment	0	0	4	0	1	0	0
Imaginary Context	0	0	0	0	0	1	0
Gestural	3	1	2	2	1	0	0
Placeholder	2	0	0	0	0	1	1
No Drawing	0	0	0	0	0	1	1

Pb = Pebbles, Cl = Clay, Sa = Sand, Gr = Gravel, Si = Silt

Note: The number of instances totals more than the number of children because of multiple journal entries and the nature of children's use of drawing and print.

Table 4. The Number of Children Using One or Two Drawings and/or Print to Represent the Mixing and Separation Activity on Their Journal Page

Graphic Form / Representation	One Drawing No Print		Two Drawings No Print		One Drawing and Print		Two Drawings And Print	
	Mix	Sep	Mix	Sep	Mix	Sep	Mix	Sep
Single State	1	7	0	0	5	3	0	0
Two States	0	0	1	2	0	0	6	2
Process	0	0	0	0	0	0	0	0
Other	2	1	0	0	0	0	0	0

Mix = mixing activity, Sep = separation activity
n = 15

Table 5. Children's Use of Elaborated Print to Represent Their Understandings by Activity

Elaborated Print Used to Represent the Earth Materials	Exploring Earth Materials	Mixing Earth Materials	Separating Earth Materials
Descriptive Phrase	0	1	4
Analogy	0	1	0
Noun Chaining	0	1	0
Sentence Chaining	0	0	1

Figure 1. These children used drawing only to represent a state and used print only to label and describe the earth materials.

Figure 2. The children predominantly (73%) represented the separation activity with one drawing, and as a single state (60%).

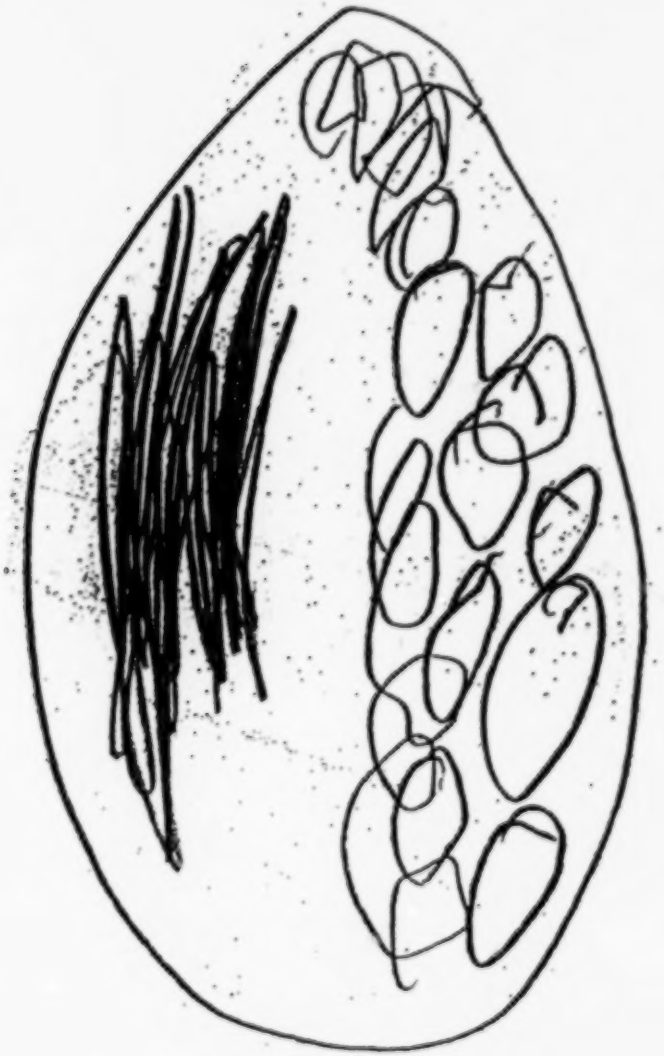
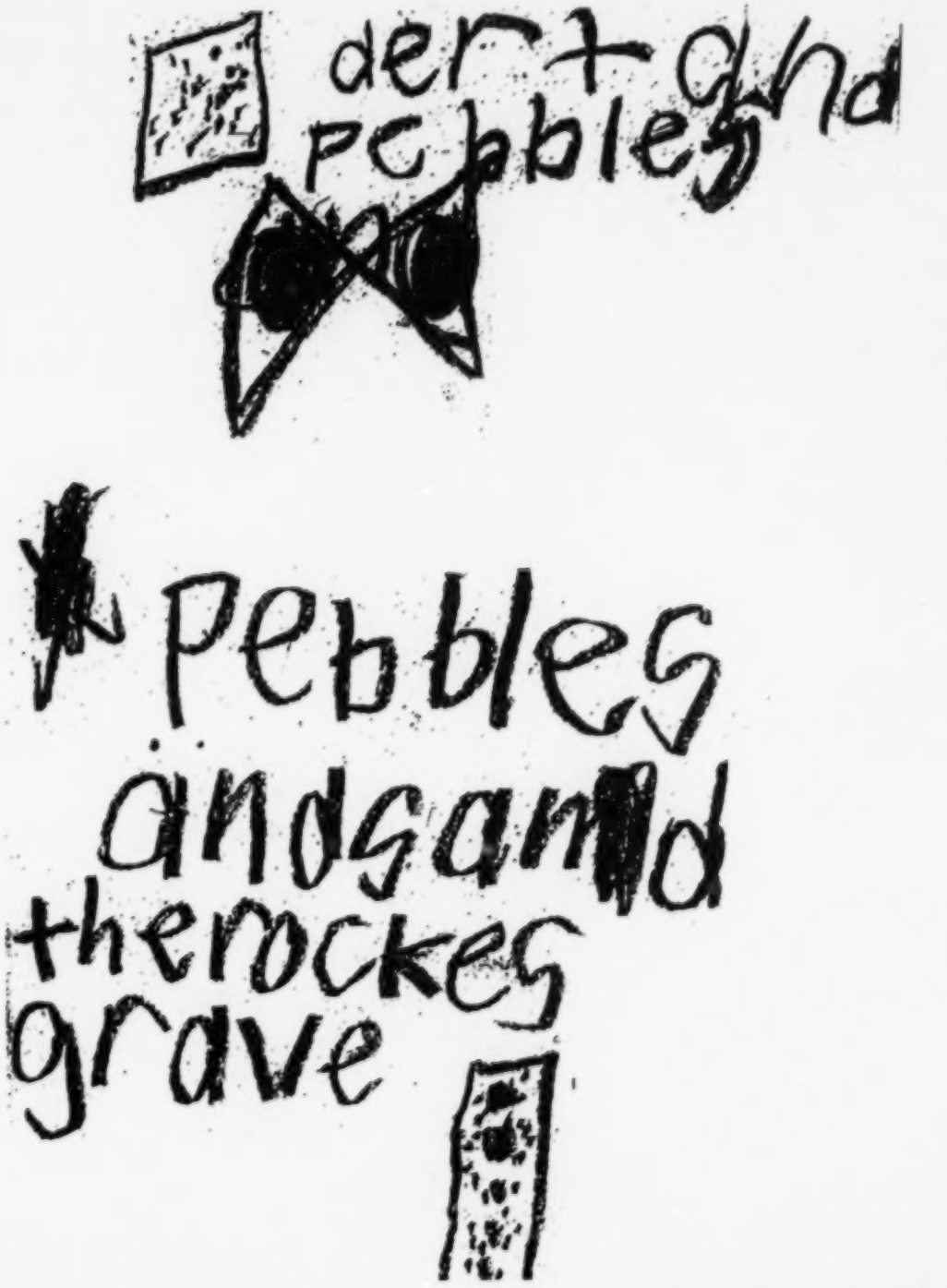


Figure 3. Example of children's elaborated print as an analogy to characterize the sand-pebble mixture.



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